An Approach for Rapid Creation of a Virtual Software Development Team

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Nowadays, companies dealing with software development are often facing problems related to cadre as a consequence of rapid technology changes and varying project requirements. Knowledge of the companies' software engineers is quickly becoming outdated and it is virtually impossible for a single developer to master all the latest technologies and approaches in his field of expertise. Consequently older technologies often remain in use. Yet another difficulty is that cadre requirements of software development companies change from project to project. Frequently, when a new project is commenced additional workforce is required, but after the project is finished these additional employees are not needed anymore.

The usual solution would be to (temporary) employ more people and to additionally educate some of the existing employees. However it is often difficult to find enough people locally that have suitable knowledge and expertise and therefore additional training of new employees is required also. If these additional employees are not needed after the project is finished, educating them only for the needs of a project is a costly solution.

An alternative solution might be to form a virtual team. The main advantage of such solution is that team members can be selected form a large pool of people having appropriate skills and knowledge (Furst, Reeves, Rosen, & Blackburn, 2004). Nevertheless, different problems have been reported that arise in such teams (Johnson, Heimann, & O'Neill, 2001) and many projects relying on a virtual team failed (Furst, Reeves, Rosen, & Blackburn, 2004). The most exposed problems in virtual teams were related to communication (Gould, 1999) and different human factors (Townsend & DeMarie, 1998). Researchers suggest that people working in virtual teams need special social and communication abilities and should be trained to work in such teams (Gibson & Cohen, 2003).

The goal of our research is to create methodological approach that would enable a software development company to instantaneously start an ad hoc virtual team when required. A company should be able to use such virtual team to implement a whole system or only parts of a system. As most of the problems in virtual teams arise due to communication and human factors our aim is to lessen their impact. A backbone of the approach comprises of core system architecture, project management, core development process and human resource management. The purpose of the backbone that is managed centrally is to enable synchronisation of virtual team members.

- **The core system architecture** facilitates construction of the system from relatively small system parts. The backbone of the architecture is a system framework that connects these parts into a functioning system. Each system part is precisely defined by a detailed description of its functions and a definition of its interface. To support such architecture we intend to use existing technologies and architectures like SOA (Erl, 2005).
- **The project management** is modified in a way that it minimises human factor risks. Work is divided into small independent tasks. Each task is defined in a way that it can be executed by a single team member in a relatively short period of time and that its execution is as independent as possible to minimise needs for communication between team members. This way the progress can be monitored precisely and problems detected more easily. To further minimise the risks more critical tasks are assigned to more dependable team members and less critical tasks to new or less dependable team members. Because tasks are relatively small it is also possible to assign highly critical tasks to more than one team member and after two or more developers completed such task only the best solution (system part) is selected for inclusion in the final system.
- **The core development process** gives detailed instructions on how to perform different types of tasks. To lessen communication problems each team member is given only the instructions that are necessary to perform the type of task he was assigned. Furthermore, instructions are adapted to the skills and knowledge of each team member. The adaptation is based on principles of situational method engineering (Brinkkemper, Lyytinen, & Welke, 1996). Program support will be created that will automate the creation of adapted task instructions. It will be based on our existing research (Bajec, Vavpotic, & Krisper).
- The intention of **the human resource management** is to create a large pool of potential team members and to monitor of the performance and skills of current team members. Search for new team members is performed via internet. Recruitment of team members is based on their previous work record, on reported knowledge and skills and on task requirements. We intend to create program support that will automate search for new team members, team members monitoring and recruitment. The automation of human resource management will be based on existing approaches that automate formation and management of virtual teams (Norman et al., 2004), (Suter, 1999), etc. Although these approaches do not focus on software development they bring many interesting ideas in the field of virtual teams' management.

Figure 1 shows the model of the proposed approach.

In our opinion, the proposed approach could offer interesting advantages as it would enable software development companies to quickly assemble a virtual team when additional workforce is needed. It would also minimise the needs for special communication and social abilities of virtual team members, as each member would be given precise instructions on how to perform the task he was assigned and tasks would be as independent as possible. However, we are aware that there are many difficulties that will have to be resolved. The main question is whether it is possible to assemble a functioning system from system parts created by many different developers and there is also the problem of maintenance and efficiency of such system.

So far we have delineated the backbone for the approach and identified its basic properties. In the next step we will detail parts of the backbone and develop the required program support. To test the approach we intend to create an experimental team comprised of university students. The purpose of this test will be to identify weak parts of the approach and to gain experience. The results of the test will enable us to improve the approach. Finally, we plan to test the approach in a real life environment.

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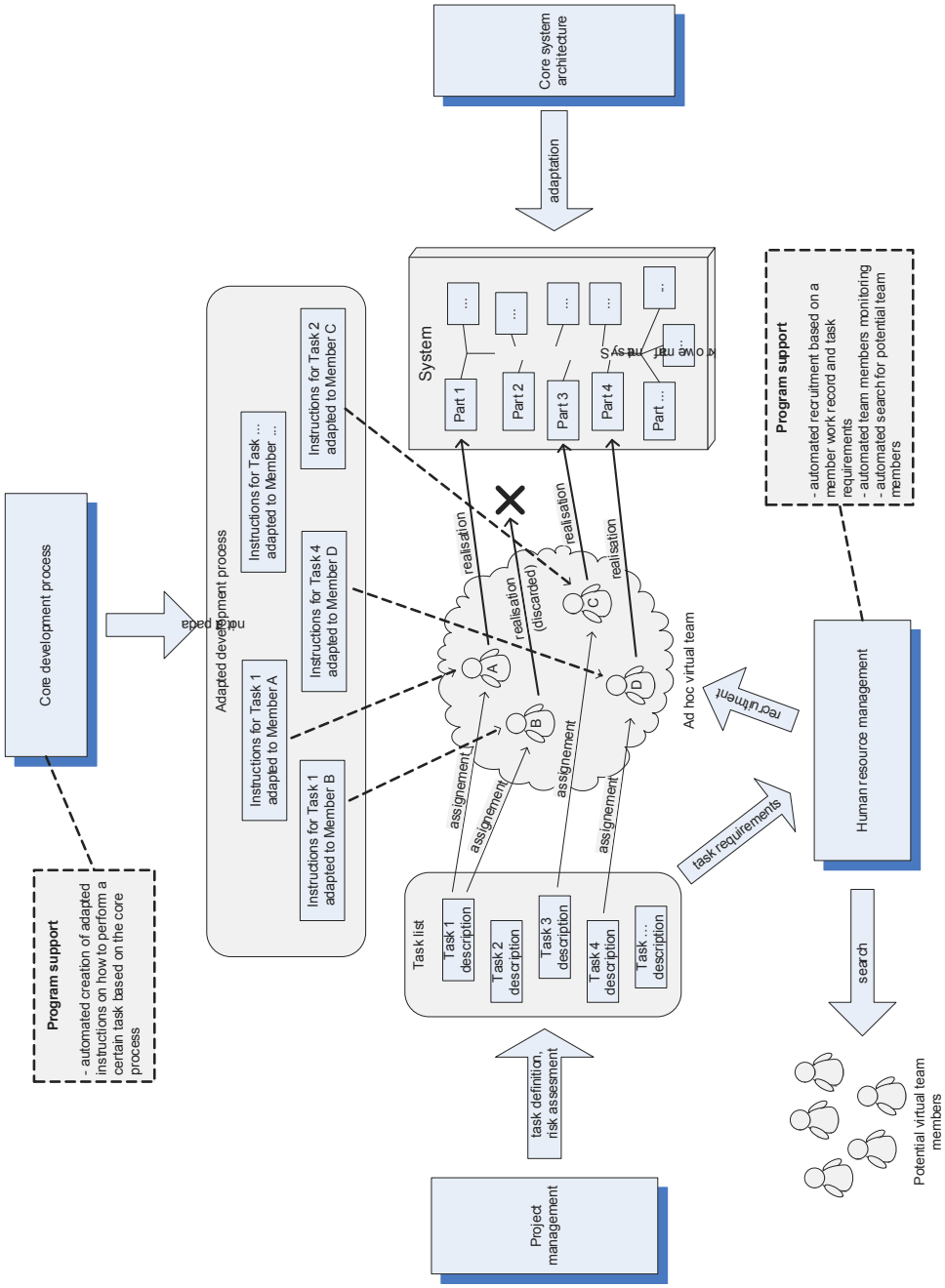
Figure 1: Model of the proposed approach that enables instantaneous formation of a virtual development team



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